CHASSIS LUBRICATION
Lubricate for SAFETY every 1,000 MILES

The Institute Spokesman

Published by
NATIONAL LUBRICATING GREASE INSTITUTE

VOLUME II • NUMBER 12 MARCH 1939

Significance of Tests for Lubricating Greases—Consistency

by GUS KAUFMAN, THE TEXAS COMPANY, RESEARCH LABORATORIES

While the making of lubricating greases of one kind or another can be traced even to ancient times, there had been very little advances in the control of uniformity until very recently. Rule of thumb methods were used. For example, a grease maker merely felt the grease to pass on its hardness, and it is only in recent years that a method for determining such a property as consistency has been standardized, i. e., the A.S.T.M. penetration for greases. Efforts have also been made to standardize the so-called "melting point" of greases.

In the past few years there has been a considerable increase in expenditures for grease research leading to improvements in both processes and products. In furtherance of this research it has been necessary to devise means for determining proof of performance, that is, having made a grease the question arises — is it any good? Unfortunately each user may have his own answer to this question and his own way of answering it. Having acquired a simple test for measuring consistency, which by no stretch of the imagination should have been utilized for any other purpose than controlling manufacture to assure products of uniform body, use has been made of this test as a means for predicting performance in service, such as in ball bearings, roller bearings, gears, etc.

For example some have assumed that, if there is very little spread between the worked and unworked penetration of a grease, there will be no further working down in a bearing and therefore no leakage. Just why this conclusion was drawn is hard to explain. Experiments on ball and roller bearings have shown that one grease, which when worked by the usual A. S. T. M. Method, is reduced to a semi-fluid mass, may and does show no leakage, whereas another grease which does not "work down" by this same method may show considerable leakage. Why is this? It merely signifies that softness and leakage do not necessarily go hand in hand. On casual thought it is natural to assume that anything which becomes softer necessarily leaks more, but let us study the phenomenon of leakage, say in a ball bearing enclosed in the conventional housing. Leakage in this case means that the grease has migrated away from where it belongs. If there is a hole in the roof and water drips through we say the roof leaks, but what about a bearing? In such a case we mean that the lubricant has been forced out of its retaining housing.

Now what would induce leakage? True, if the lubricant became so fluid as to flow out of the retaining housing then it would be considered leakage but the question comes up how fluid must it be before it will do this. By our experiments, a lubricant many times softer than the softest value measurable on the A. S. T. M. Penetrometer still will not show leakage from the housing and will even show larger quantities of grease remaining on the bearing than is the case with a grease which does not work down. True, in a plain bearing with open ends, such a grease might show greater leakage.

Since mere softening of a grease does not necessarily result in leakage, in fact may prevent it, let us see what else might cause a grease to leak out. If the volume of the grease is too great, it has to go somewhere and will eventually force itself out of the bearing. What would cause this increase in volume? Expansion due to heat, air entrainment, or vaporization of volatile matter in the grease are some of the common causes. Air entrainment may depend upon several factors but it is obvious that if sufficient air is occluded by the grease the volume will increase, expansion will occur, and eventually leakage will take place.

In addition to the above, there is another still more important factor causing leakage depending neither upon expansion due to heat nor air entrainment — that elusive property of the grease termed "texture". Given two greases of the SAME consistency, i.e., A.S.T.M. Penetrations, and different textures, results as regards leakage may be astoundingly different. Why is this? Because although we ordinarily think of leakage as something that leaks through, i. e., by gravity, in a bearing there are many parts in motion, there is a continual change of position of the rotating parts as well as the grease and shearing action is taking place which may cause a definite pumping action. As regards the grease, this continual change of position or transference may be the first step in causing leakage. Let us consider three possibilities of the action of a grease in say a ball bearing, assuming that the product has been made satisfactorily resistant to air entrainment and that temperatures are not so extreme as to cause undue expansion due to heat.

First take the case of a grease which works down as the rotating parts pass through it causing the transference of the grease to be along the plane of rotation, i. e., the grease merely follows the rotating parts as would a fluid. Under these conditions there should be little or no leakage since the pumping action is not away from the rotating parts. Experiments have confirmed this where the grease does not entrain air.

Consider next a grease of such texture as to cause the rotating parts to channel

(Continued on page 4)

You'll Find the '39 Batteries At These Places

In the left engine compartment

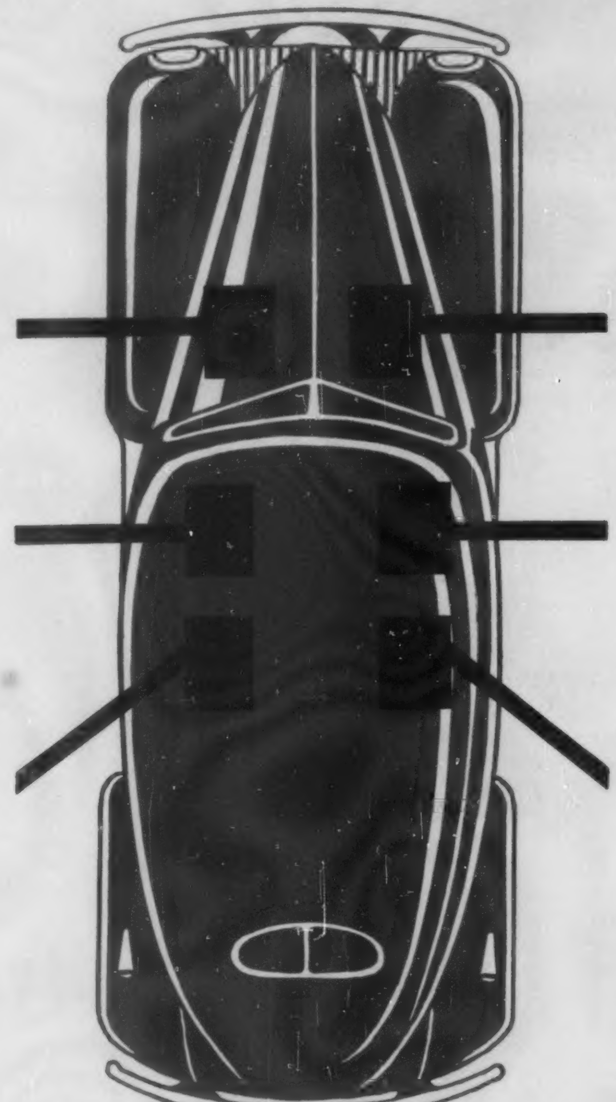
Graham
Hudson
Oldsmobile
Pontiac
Studebaker

Under the left floor boards

LaSalle

Under the left seat

Chrysler
DeSoto
Dodge
Hupmobile
Nash
Packard
Plymouuth



In the right engine compartment

Bantam
Buick
Cadillac V-8's
Ford
Lincoln-Zephyr
Mercury
Overland
Willys

Under the right floor boards

Chevrolet
Lincoln V-12

Under the right seat

Cadillac V-16

HERE'S THE LINE-UP, ARRANGED ALPHABETICALLY

Make of Car	*Location of Battery*
Bantam	Right — In engine compartment
Buick	Right — In engine compartment
Cadillac V-8's	Right — In engine compartment
Cadillac V-16	Right — Under front seat
Chevrolet	Right — Under floorboards
Chrysler	Left — Under front seat
DeSoto	Left — Under front seat
Dodge	Left — Under front seat
Ford	Right — In engine compartment
Graham	Left — In engine compartment
Hudson	Left — In engine compartment
Hupmobile	Left — Under front seat
LaSalle	Left — Under floorboards
Lincoln V-12	Right — Under floorboards
Lincoln-Zephyr	Right — In engine compartment
Mercury	Right — In engine compartment
Nash	Left — Under front seat
Oldsmobile	Left — In engine compartment
Overland	Right — In engine compartment
Packard	Left — Under front seat
Plymouth	Left — Under front seat
Pontiac	Left — In engine compartment
Studebaker	Left — In engine compartment
Willys	Right — In engine compartment

Courtesy Super Service Station

Material appearing in The Institute Sp

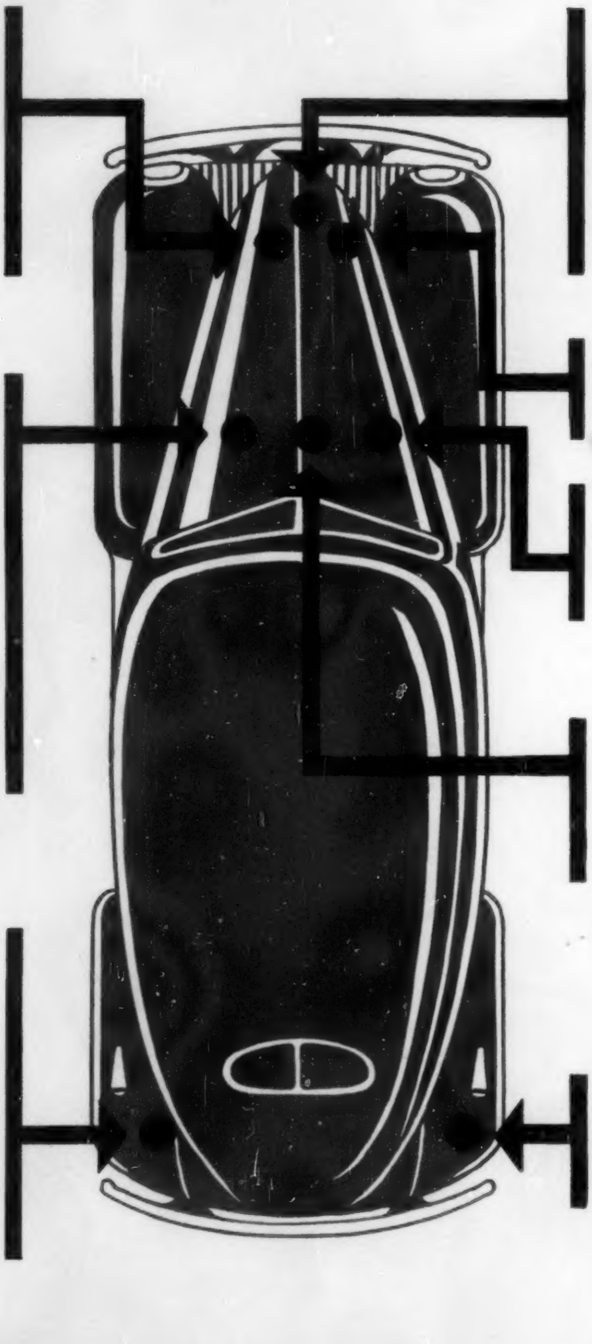
The
INSTITUTE
SPOKESMAN

Published Monthly by THE NATIONAL LUBRICATING GREASE INSTITUTE

GEORGE W. MILLER . . . *Editor*
498 Winspear Avenue, Buffalo, N. Y.

We are glad to welcome Metasap Chemical Co., Harrison, N. J., as Associate Member.

This Will Help You Find the Water, Oil and Gasoline Fill Pipes on the 1939 Cars



Water Fill Pipe Left Side Under Hood

Bantam, Cadillac, Chrysler, DeSoto, Dodge, Hudson, Hupmobile, LaSalle, Lincoln V-12, Mercury, Oldsmobile, Packard, Plymouth

Water Fill Pipe Center Under Hood

Ford, Graham, Lincoln-Zephyr, Nash, Overland, Pontiac, Studebaker, Willys

Water Fill Pipe On Right Side Under Hood

Buick, Chevrolet

Oil Fill Pipe On Left Side

Bantam, Cadillac, Chrysler, DeSoto, Dodge, Ford*, Graham, Hudson, Hupmobile, LaSalle, Lincoln V-12, Mercury*, Nash-LaFayette, Oldsmobile, Packard, Plymouth, Pontiac, Studebaker

* Gauge Stick Location

Oil Fill Pipe On Right Side

Buick, Chevrolet, Overland, Willys

Oil Fill Pipe In Center

Ford, Lincoln-Zephyr, Mercury, Nash Ambassador

Gasoline Fill Pipe At Left

Bantam (under Hood), Buick (under trap door), Cadillac, Chrysler, DeSoto, Dodge, Ford, Graham, Hudson, Hupmobile 6 & 8, LaSalle, Lincoln-Zephyr, Mercury, Nash, Nash-LaFayette, Packard, Plymouth, Pontiac

Gasoline Fill Pipe At Right

Chevrolet, Hupmobile Skylark, Lincoln V-12, Oldsmobile, Overland, Studebaker, Willys

Tests for Lubricating Greases

(Continued from page 1)

through the grease. If channeling of the grease occurs, there is, of course, little or no transference of the grease, the rotating parts of the bearing simply cutting a path through the grease. However, under these conditions there is little or no lubrication, especially after the small amount of grease originally adhering to the rotating parts is eventually consumed and due to channeling this film of lubricant is not replaced. Of course, channeling of the grease will produce a low torque in the bearing and some have been misled by this phenomenon to assume that the initially low torques are indicative of superior lubrication.

With regard to a grease which shows channeling there will be no leakage provided expansion is at a minimum. At first thought this may appear to be an ideal product but the question which must be answered is—How much grease remains for lubrication and how long can this grease last? Since a channel is cut through the grease supply, obviously little lubricant, if any, can be expected to work back on to the bearing. Hence, isn't it reasonable to assume that such a grease might appear excellent at first but have a low factor of safety for long time usage?

As opposed to channeling there may be a condition of too much transference of the grease away from the rotating parts due to certain textures which permit a pumping action to be set up, causing the grease actually to be pumped out of the bearing with no expansion whatever occuring. It is common practise where leakage occurs with a grease of a certain consistency to try a grease of a harder consistency, but instead of getting improvement the harder grease may show surprisingly more leakage due to the particular texture of the grease setting up this undesirable pumping action. It is true that if the grease be made hard enough channeling will occur, no leakage may take place, but also there will be little or no lubrication.

Furthermore, it has been shown that one texture may be satisfactory at one speed and unsatisfactory at another speed.

It is seen therefore that a routine test such as a penetration although of value in controlling uniformity of manufacture cannot be depended upon to predict performance in service and must be supplemented by other carefully devised tests which more nearly approach practical service conditions. The proper design of such practical laboratory testing devices is indispensable in the solution of grease lubrication problems.